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EXAMINER	
GOODREAU, G	

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This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☐ Responsive to communication filed on _____ ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), ~~—~~ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☒ Notice of References Cited by Examiner, PTO-892.
2. ☐ Notice of Draftsman's Patent Drawing Review, PTO-948.
3. ☐ Notice of Art Cited by Applicant, PTO-1449.
4. ☐ Notice of Informal Patent Application, PTO-152.
5. ☐ Information on How to Effect Drawing Changes, PTO-1474.
6. ☐ _____

Part II SUMMARY OF ACTION

1. ☒ Claims 1-22 are pending in the application.
   Of the above, claims 20-22 are withdrawn from consideration.
2. ☐ Claims _____ have been cancelled.
3. ☒ Claims 7-19 are allowed.
4. ☒ Claims 1-6 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____. has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
12. ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☒ (no) been received ☐ been filed in parent application, serial no. _____; filed on _____.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☒ Other

* PCT foreign document submitted but Japanese foreign document is missing at this time.

15. Restriction to one of the following inventions is required under 35 U.S.C. § 121:

I. Claims 1-19, drawn to a dry etching method, classified in Class 156, subclass 643.

II. Claims 20-22, drawn to a dry etching apparatus, classified in Class 156, subclass 345.

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (M.P.E.P. § 806.05(e)). In this case the search required for Group I is not required for Group II.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 C.F.R. § 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a diligently-filed petition under 37 C.F.R. § 1.48(b) and by the fee required under 37 C.F.R. § 1.17(h).

During a telephone conversation with attorney Michael Gilman on March 16, 1994 a provisional election was made with traverse to prosecute the invention of the dry etching claims, claims 1-19. Affirmation of this election must be made by applicant in responding to this Office action. Claims 20-22 are withdrawn from further consideration by the Examiner, 37 C.F.R. § 1.142(b), as being drawn to a non-elected invention.

16. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Evaluations of the level of ordinary skill in the art requires consideration of such factors as various prior art approaches, types of problems encountered in the art, rapidity with which innovations are made, sophistication of technology involved, educational background of those actively working in the field, commercial success, and failure of others.

The "person having ordinary skill" in this art has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The evidence of record including the references and/or the admissions are considered to reasonably reflect this level of skill.

17. Claims 1-6 are rejected under 35 U.S.C. § 103 as being unpatentable over Colombo et. al. further in view of (Shinagawa or Fujimura).

Colombo et. al. disclose a process for rie etching an Al layer on a semiconductor located beneath a patterned resist layer in a Cl-ambient plasma. The Al layer is formed on a barrier layer on the semiconductor. the barrier layer is comprised of Ti/W or Ti/TiN. The etched substrate is then passed into an adjacent postetch treatment chamber where the resist layer is removed along with some of the corrosive Cl residues using an O_2 ambient plasma. This is discussed, and shown on pages 95-99. Colombo et. al. fail, however, to disclose the following aspects of applicant's claimed invention:

- the specific use of a one step combination ashing/neutralization step where the resist and Cl residues are removed from the Al layer using a plasma comprised of H_2O, and O_2;

- the specific use of post-etch treatment steps which employ only the neutral species in a plasma by extracting out the

charged particles prior to contacting the substrate with the metastable plasma; and

- the specific post-etch treatment temperatures claimed by the applicant.

Both Shinagawa, and Fujimura teach that is desireable to ash a resist layer in a metastable plasma comprised of O_2, and H_2O. They both employ a grid to remove the charged species from the plasma in order to reduce the amount of radiation damage done to the substrate. They both employ ashing temperatures between 100 and 250°C (ie- 180°C in Shinagawa, and 200°C in Fujimura).

It would have been obvious to one skilled in the art to replace the O_2 ashing/Cl-neutralization step taught by Colombo et. al. with the O_2/H_2O metastable plasma ashing taught by either Shinagawa or Fujimura since this simply represents an alternative, and at least equivalent means for conducting the ashing step taught by Colombo et. al. Further, this step would have inherently neutralized the Cl residues based on the teachings of Colombo et. al. regarding O_2 ambient plasma ashings, and residual Cl residues.

It would have been prima facie obvious to employ any of a variety of ashing temperatures including those claimed by the applicant.

These are all well known variables in the plasma etching art which are known to effect both the rate and quality of the plasma etching process. Further, the selection of particular values for these variables would simply involve routine experimentation and would not necessitate any undo experimentation which would be indicative of a showing of unexpected results.

18. Claims 7-19 are allowable over the prior art of record.

19. Claims 20-22 are rejected under 35 U.S.C. § 103 as being unpatentable over Tateiwa as applied in paragraph 20 of the previous office action.

20. Claims 1-6 are rejected under 35 U.S.C. § 103 as being unpatentable over Tateiwa further in view of Shinagawa et. al. as applied in paragraph 17 of the previous office action.

21. In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents **must** be submitted in response to this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 C.F.R. § 1.116, which will be strictly enforced.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner George Goudreau whose telephone number is (703) 308-1915.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

R. BRUCE BRENEMAN
Supervisory Patent Examiner
Art Unit 1109

G.Goudreau:mm
March 24, 1994